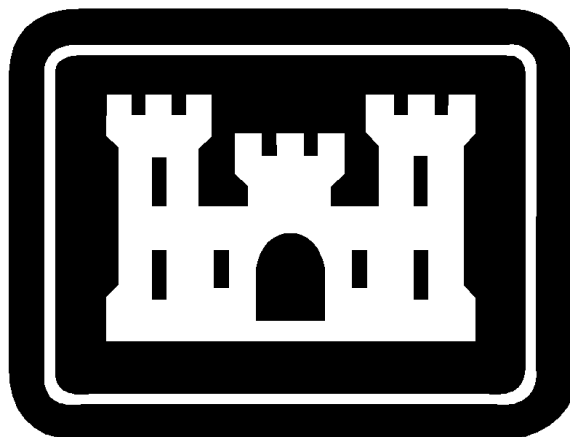


**APPENDIX D**

**PORTLAND DISTRICT  
DESIGN BRANCH CADD STANDARDS MANUAL**



**US ARMY CORPS  
OF ENGINEERS**

**FIRST EDITION  
MARCH 1997**

# APPENDIX D

## PORTLAND DISTRICT DESIGN BRANCH

### CADD STANDARDS MANUAL

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## CHAPTER 1 - GENERAL

### 1.1 Scope.

This manual provides guidance and procedures for the preparation of computer-aided drafting and design (CADD) drawings for the Design Branch of the Portland District. This manual is not a detailed guide to drafting standards and techniques nor is it a user's reference for CADD software programs. Users of this manual are assumed to be proficient in drafting techniques as well as the CADD program they are using. In addition, this manual complies with applicable regulations regarding CADD products.<sup>1,2</sup>

### 1.2 Purpose.

The purpose of this manual is to standardize and clarify CADD procedures used by the Design Branch of the Portland District. These standards shall be followed whether the work is performed by an Architect-Engineer (A/E) firm or prepared in-house. These standards include details, symbols, level assignments, units of resolution, fonts, colors, title blocks, drawing size, and metric and English scaling.

### 1.3 Equipment and Software.

The Design Branch uses networked PCs that have either Windows NT or Windows 95 as their operating systems. They are networked together on a CADD Local Access Network (LAN). A server on the CADD LAN is used to store design files for current and past projects. Storing the files on a server allows multiple users the ability to reference them. Plotters on the network include an HP 750, HP 650 and several HP Laserjet IVs which print on 11"x17" paper. The current CADD software package being used is Bentley Systems, Inc., MicroStation 95, version 5.05.

### 1.4 Good Practice.

The following rules of good practice in the production of contract drawings should be followed.

a. Keep drawings to a minimum. Include only those details that are necessary to ensure a full understanding of the contract requirements. Avoid repetitive presentation. From both a contractual point of view and that of economy in the drafting process, it is better to show a requirement only once.

b. Show work limits. Right-of-way and work limits and access to these limits shall be clearly delineated on the drawings. Indicate other topographic detail that may be affected by or may restrict the construction.

c. Orientation. Orientation of plans should be consistent and as directed by the customer. General guidelines for orienting drawings are as follows:

(1) The north arrow should be located in the top left corner of the plan view.

(2) General plans, elevations, and longitudinal sections of channels, locks, dams, and similar structures shall be oriented with the direction of flow of water from top to bottom of the sheet, if practicable, or from right to left. Detailed plans shall be oriented with the direction of flow of water from top to bottom. Stream cross sections shall be shown as if the observer were looking downstream.

(3) For existing projects, general plans, elevations, and longitudinal sections of channels, locks, dams, and similar structures shall be oriented to match existing project drawings.

d. Scales. Drawings shall be scaled so that all elements on the drawing are readable on a standard size contract drawing.

(1) Scales shall be selected to avoid overcrowded and cluttered conditions on the drawings. Drawing layout, together with proper scales to clearly delineate the project, should be carefully planned in advance.

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<sup>1</sup> Tri-Service CADD/GIS Technology Center. A/E/C CADD Standards Manual. (Release 1.4, June 1995).

<sup>2</sup> U.S. Army Corps of Engineers. Portland District. Project Drawings, NPPR 1110-2-7 (1996).

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(2) Where necessary to maintain proper scale, drawings of large structures shall be placed on two or more sheets, with the appropriate key plan and match lines provided on these sheets. Key plans should be placed in the lower right hand corner of each drawing.

(3) The use of unusual scales should be avoided.

(4) Parallel lines should never be so close together that they will merge into one line. The clear space between lines should always be of greater width than the adjoining lines.

e. Drawing Layout. It is recommended that drawing packages be assembled in the following order:

(1) General sheets to include the cover, index, and site plan sheets.

(2) Civil sheets.

(3) Geotechnical sheets.

(4) Architectural sheets.

(5) Structural sheets. In general, concrete outline sheets shall proceed reinforcing steel sheets.

(6) Mechanical sheets.

(7) Electrical sheets.

(8) Landscaping sheets.

(9) Hydrology and hydraulic sheets.

(10) Informational sheets.

f. Leaders. Leaders shall be used to indicate a part or portion to which a number, note, or other reference applies and shall terminate in an arrowhead, tilde, or other acceptable terminator. Arrowheads should always terminate at a line when possible. Leaders should terminate at the start or end of the note, reference or dimension.

### 1.5 Definitions.

Terms used in this manual are defined below.

a. Base File. A base file contains a basic structure, model, assembly, or piece of equipment for the project drawn to scale. There may be several base files for a project depending on the complexity of the project and the number of disciplines involved. Base files are referenced by drawing files.

b. Drawing File. A drawing file is the final product that will be reproduced and issued as a contract drawing. Drawing files normally contain details, dimensioning, and text. Drawing files reference a border file and may reference one or more base files. Drawing files should be laid out so that all elements on the drawing are readable on a standard size contract drawing.

c. Active File. The active file is the MicroStation design file that the user is currently working on. It may be either a base file or a drawing file.

d. Reference File. Reference files are MicroStation design files that can be attached to (associated with) the active design file and displayed for reference. As reference files, they cannot be modified from within the active file. Typical reference files associated with the active design file are base files and the border file.

e. Border File. A design file containing the border and title block outlines used by all drawings in a project. The border file will be referenced by each project drawing file.

f. Contract Drawing. Final version of a drawing file that is issued.

g. Informational Drawing. An as-built drawing, soil boring logs drawing, or other drawing related to the project but not part of the contract work. These drawings are provided to assist the Contractor in understanding the work to be accomplished under the contract.

h. Cover Sheet. Project cover sheet with the names and signatures of the District Engineer, Chief of Planning and Engineering, and appropriate branch chiefs.

i. Designer's Notes. Notes placed on the drawing indicating the design codes used, design loads, materials specified, and the designated material strengths for that feature.

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## CHAPTER 2 - BASIC STANDARDS

### 2.1 Line Widths.

Line widths shall be as shown in Table 2-1.

<i>Table CHAPTER 2 -1 CADD Line Widths</i>				
Line Thickness	Leroy Pen Designation	Inches	Millimeters	MicroStation Line Weight
Thin	0000	0.004	0.10	wt = 0
Medium	000	0.010	0.25	wt = 1
Medium Thick	0	0.014	0.35	wt = 2
Thick	1	0.020	0.50	wt = 3
Extra Thick	5	0.028	0.70	wt = 4

- Thin Lines (0.10 mm). Thin lines should be used for depicting background object lines, centerlines, hidden lines, and most patterning symbols.
- Medium Lines (0.25 mm). Medium lines should be used for depicting dimension leaders/witness lines, dimension lines, dimension text, text for notes/callouts, schedule boxes/charts, text inside schedules, minor object lines, line terminators (arrowheads, dots, and slashes), and note leader lines.
- Medium Thick Lines (0.35 mm). Medium thick lines are the default line weight for drawing most objects. Medium thick lines should also be used for section titles.
- Thick Lines (0.50 mm). Thick lines should be used for minor title underlining, text for titles, and object lines requiring special emphasis.
- Extra Thick Lines (0.70 mm). Extra thick lines should be used sparingly. Extra thick widths are appropriate for use as elevation grade lines, building footprints, or top of grade lines on section/foundation details.

### 2.2 Line Types\Styles.

Use the default line styles supplied with MicroStation 95.

### 2.3 Line Color.

The default color table supplied by MicroStation 95 should be used for the production of all CADD drawings. The assignment of line colors shall be the responsibility of the engineer or technician/draftsman unless otherwise defined.

### 2.4 Contract Drawing Size.

The standard size for contract drawings using metric units of measurement shall conform to SI designation A2 (420 mm by 594 mm). The standard size for contract drawings using English units of measurement is 14" by 20" inclusive of the binding margin.

### 2.5 Plotting.

Plots can be generated on the network plotters or laser jet printers. Plot size shall dictate where the plots are sent. The network plotters are located in the plot room and include an HP 750C (24" wide paper) and HP 650C (36" wide paper). Several HP Laserjet IVs are available for 11"x17" paper plots.

- Rotation. Plots will generally be rotated 270 degrees. This will allow a larger border on the left margin to allow for hole punching or binder clips.
- Trimming. Standard English drawing plots will be trimmed to 15" by 22". This will allow a 1/2" border on the top, bottom, and right side margins and a 1 1/2" border on the left margin. Metric drawings will be

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trimmed to 445 mm (17 1/2") by 635 mm (25"). This will allow a 1 1/2" border on the left margin and a 1/2" border on the top, bottom, and right side margins.

- c. Shading or color prints shall not be used.
- d. Custom developed pen tables shall not be used.

### 2.6 Border Files.

Border files used for Design Branch CADD products shall be as shown in Figure 2-1. The standard border files (border\_english.dgn for English and border\_metric.dgn for metric) for all Design Branch products can be found in the Standards directory ("Tyler\Standard\PE") on the CADD LAN.

- a. The border file shall be referenced by each drawing file. Only one border file shall be created for each project. It shall be located in the project directory with all of the project drawing files.
- b. No drawing elements or text shall be located outside the border of the final contract drawing.
- c. The file name and the time/date stamp indicating when the drawing was plotted shall appear on review drawings. It shall be turned off for final contract drawings.
- d. Attach the border file at the active scale of the drawing file.
- e. A/E firms will be provided a border file for their project. Changes to the assigned border file will not be made without the permission of the Technical Manager.

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*Figure CHAPTER 2 -1 Standard Border Sheet*

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### 2.7 Drawing Scales.

All plans, assemblies, models, etc. in base files shall be accurately drawn at full scale. This concept facilitates checking of completed designs, ensures correctness of dimensions when auto-dimensioning a drawing, and ensures compatibility with all other users.

- a. Recommended drawing scales are listed Table 2-2.

<i>Table CHAPTER 2 -2 Recommended Drawing Scales</i>			
<b>English Scales</b>		<b>Metric Scales</b>	
Scale	AS =	Scale	AS =
12" = 1'-0"	1	1:1	1
6" = 1'-0"	2	1:2	2
3" = 1'-0"	4	1:2.5	2.5
1 1/2" = 1'-0"	8	1:5	5
1" = 1'-0"	12	1:10	10
3/4" = 1'-0"	16	1:20	20
1/2" = 1'-0"	24	1:25	25
3/8" = 1'-0"	32	1:50	50
1/4" = 1'-0"	48	1:100	100
3/16" = 1'-0"	64	1:200	200
1/8" = 1'-0"	96	1:250	250
3/32" = 1'-0"	128	1:500	500
1/16" = 1'-0"	192	1:1000	1000
1" = 5'	60		
1" = 10'	120		
1" = 20'	240		
1" = 30'	360		
1" = 40'	480		
1" = 50'	600		
1" = 60'	720		
1" = 80'	960		
1" = 100'	1200		
1" = 200'	2400		
1" = 300'	3600		
1" = 400'	4800		
1" = 500'	6000		
1" = 1000'	12000		

- b. Bar Scales. Bar scales are contained in the general cell library. Bar scales shall be inserted at the same active scale of the referenced border file. Bar scales should be centered 5 mm (1/4") below each applicable view, section, or detail description. Text describing the scale shall not be used (i.e. 1/16"=1').

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### 2.8 Title Block.

A title block along the right-hand margin of the drawing shall be used (see Figure 2-1). The title block is part of the standard border file and consists of the following sections, in order, from top to bottom:

- (1) Portland District logo.
- (2) Revision Block.
- (3) Drawing Data Block.
- (4) Sheet Title Block.
- (5) Drawing Status Block.
- (6) Drawing Number
- (7) Sheet/Plate Number.

Each of these sections is described below.

- a. Portland District Logo. The Portland District logo is part of the border file.
- b. Revisions Block. Revisions to drawings are done to reflect an amendment to a contract prior to award or a modification to a contract after it is awarded. In order to assist Construction Branch with the management of amendments or modifications, the amendment or modification number should be clearly shown in the revisions block of the drawing.

M3-3	15 JUN 96	1/2" CONDUIT CHANGED TO 3/4" CONDUIT.	DLE
M1-2	15 MAY 96	BRASS BUSHING CHANGED TO STEEL BUSHING.	DLE
A1-1	15 APR 96	SLOPE CHANGED FROM 1:2 TO 1:3.	DLE
Revision	Date	Description	By

*Figure CHAPTER 2 -2 Sample Revisions Block*

The procedure for revising drawings and noting those changes on the drawings shall be as follows:

(1) Drawing changes shall be annotated with a small triangle placed adjacent to the revision on the drawing. The revision number shall be placed inside the triangle. Previous revision triangles shall be deleted from the drawing. The triangle is a cell located in the general cell library. Revisions shall be numbered sequentially beginning with the number 1.

(2) In the revision block, the amendment number (or modification number), followed by a dash and the drawing revision number, shall be placed in the next available line in the "Revisions" column.

(3) The date the amendment or modification is expected to be issued shall be placed in the "Date" column. Dates shall follow the day-month-year format (e.g. 10 DEC 96). Three-letter designations shall be used for the month.

(4) A short description of the change shall be placed in the "Description" column.

(5) The lead engineer making the revisions or the appropriate section chief's initials shall be placed in the "By" column.

(6) Changes to the revisions block shall be made in the drawing file that is being revised, not the attached border file.

(7) The CADD file shall be saved using the updated version number (See Chapter 3). In addition, the CADD file name shall be revised to reflect the new version number in the Drawing Data block of the drawing.

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c. Drawing Data Block. A sample drawing data block is shown in Figure 2-3.

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS PORTLAND, OREGON	Designed by: D. ERICKSON	Date: 10 DEC 96
	Drawn by: J. TUPPER	CADD File Name: BDS001D13C00.DGN
A/E Firm (If applicable, otherwise change levels to remove line and center Corps text)	Checked by: R. WRIDGE	Technical Manager: J. NELSON
	Submitted by: DONALD R. CHAMBERS, P.E. Chief, Structural and Architectural Design Section	

*Figure CHAPTER 2 -3 Sample Drawing Data Block*

The drawing data block shall be completed as follows:

(1) The first initial and the last name of the principal individual responsible for designing, drawing, and checking the sheet shall be placed in the “Designed by”, “Drawn by”, and “Checked by” blocks. The first initial and last name of the technical manager shall be placed in the “Technical Manager” block. The full name and title of the Chief of the appropriate design section shall go in the “Submitted by” block.

(2) The date the drawing was originally issued shall be placed in the “Date” block. Dates shall follow the day-month-year format (e.g. 10 DEC 96). Three-letter designations shall be used for the month.

(3) See chapter 3 for the information on the CADD file name. Directory information shall not be included with the CADD file name.

(4) The name and address of the A/E firm (if applicable) shall be typed in the block below the Corps text. Text size shall match that of the Corps text. Symbols and special cells shall not be used. The name of the A/E firm shall be placed in each drawing file. The border file will not be altered by placing the name of the A/E firm in the border file.

(5) For contract drawings prepared by A/E firms, the name and title of the project manager shall be placed in the “Technical Manager” block. The “Technical Manager” text shall be turned off in the drawing file.

d. Sheet Title Block. A sample sheet title block is shown in Figure 2-4.

COLUMBIA RIVER OREGON/WASHINGTON	
<b>BONNEVILLE DAM AND RESERVOIR</b>	
SECOND POWERHOUSE	
<b>SEISMIC REHABILITATION PROJECT</b>	
STRUCTURES FACILITY	FISH VIEWING
<b>SECTIONS AND DETAILS</b>	
<b>ADDITIONAL SHEET NAME LINE</b>	

*Figure CHAPTER 2 -4 Sample Sheet Title Block.*

(1) The river system and project location shall be placed on the first line. Project locations are also listed in Table 3-2.

(2) The project name shall be placed on the second line in the sheet title block. Official project names are listed in Table 3-2.

(3) The main project feature shall be placed on the third line.

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- (4) The job title shall be placed on the fourth line.
- (5) The discipline and the subfeature shall be placed on the fifth line.
- (6) The sheet name shall be placed on lines six and seven.

e. Status Block. The status block contains the review status of the drawing (e.g. 30%, 60%, or 90% Review) or As-Built information.

f. Drawing Number. Assigned by PE-T.

g. Sheet (or Plate) Number. Sheets (plates) shall be numbered sequentially beginning with the number 1 for each discipline. The letter of the discipline producing the sheet (or plate) shall be placed before the sheet number (i.e. C1, S1, or E1). Discipline letters shall correspond to those listed below.

W - General  
S - Structural  
A - Architectural  
M - Mechanical  
H - Hydrology and Hydraulics  
G - Geotechnical  
E - Electrical  
C- Civil  
L - Landscaping  
I - Informational

The appropriate level shall be turned on in the border file for Sheet, Plate, or Sheet and Volume. The “sheet” title shall be used for plans and specifications products and the “plate” title shall be used for design memorandums, letter reports, or other design branch products. Very large plans and specifications products shall use the sheet and volume title.

h. Title Block Text Height and Weight. The correct text attributes for each title block element are located outside the border outline. CADD users shall match the appropriate text attributes and place the new text in the title block area on level one of the active file.

### 2.9 Dimensioning.

Automatic dimensioning should be used wherever possible and feasible. Automatic dimensioning allows the rapid changing of dimensioning if the outline of the drawing element changes.

a. Standard drafting practice dictates that dimensions should be placed above or to the left of each object. Dimensions or notes inside an object should be avoided. Dimensions should be above the dimension line, not in the line. Radial or diametral dimensions should be horizontal, in-line. Diameter and radius symbols should follow the dimension.

b. Metric Dimensioning. Methodologies for dimensioning metric drawings are based upon the recommendations of the Construction Metrication Council of the National Institute of Building Sciences, Washington, D.C. These recommendations comply with ASTM E 621-84, “Standard Practice for the Use of Metric (SI) Units in Building Design and Construction.”

(1) Typically, the unit of measure shown on drawings shall be millimeters. However, site plans or other drawings drawn to scales of over 1:200 should use the meter as the unit of measure. Unit notations are unnecessary and should not be used when the unit of measure is millimeters. The dimension is simply provided as an integer (no decimal point).

(2) When the unit of measure is meters, the dimension is provided as a real number taken to three places (use a decimal point) and again, no unit notation is used (i.e. 350.500).

(3) A note shall be placed on the general drawing stating “Dimensional units without a decimal point are in millimeters (e.g. 250). Dimensional units with three decimal points are in meters (e.g. 250.000)”.

(4) Commas shall not be used when providing large units of measure; instead, a space replaces the traditional comma in numbers containing five or more large digits (e.g., the number 45,000 shall be written 45 000). In numbers containing only four digits, no space shall be used (e.g., 5000). However, until CADD software

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can automatically place a space in numbers containing five or more digits, special efforts to place an additional space shall not be taken.

c. English Dimensioning. Architectural and associated drawings shall be dimensioned in feet - inch fractions (i.e. 2' - 4 1/2"). Civil drawings for site plans may be dimensioned in decimal feet or feet - inch fractions depending on the plan shown.

d. Dual dimensioning shall not be used.

### **2.10 Terminators**

The default line terminators supplied by MicroStation 95 should be used for the production of all CADD drawings. The arrowhead terminator shall be filled in and the width and height dimensions shall be set to 1.5 and 0.5, respectively.

### **2.11 Cover Sheet.**

The standard cover sheet used by the Portland District for plans and specifications products is shown in Figure 2-5. The signature block of each appropriate Planning and Engineering Branch Chief shall be placed on the cover sheet, in addition to the signature blocks of the District Engineer and Chief of Planning and Engineering Division.

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*Figure CHAPTER 2 -5 Sample Portland District Standard Cover Sheet.*

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### CHAPTER 3 - DRAWING FILE ORGANIZATION

#### 3.1 Basic File Setups.

All CADD files shall be set up with the following parameters.

- a. CADD Files. Each CADD file shall contain only one drawing file.
- b. File Format. All drawings shall be formatted using a 3-D file format. Plans shall be drawn in the top view at the correct elevation (z=elevation). To make a 2-D drawing, using a 3-D seed file, set the 'z' depth to 0.
- c. Location on Drawing Plane. Plan layouts shall be located on the drawings such that stationing along the major axis of the project is directly related to the position on the x-axis (or y-axis depending on the project), and such that offset from the project centerline can be directly related to the y-coordinate (or x-coordinate).
- d. Location of Text. Text, notes, section callouts, section and detail titles, plan dimensions, etc., shall be defaulted to z=0 by setting z=0 and enabling 'depth lock'.

#### 3.2 Working Units.

Working units shall be as listed in Table 3-1.

Table CHAPTER 3 -1 MicroStation Working Units for Portland District CADD Files				
Units	Feet/Inches	Feet/Tenths	Meters	Millimeters
Master Units (MU)	'	'	m	mm
Subunits (SU)	"	none	none	none
Resolution				
SU per MU	12	10	1000	1
PU per SU	3200	100	1	100
Note: PU = Positional Units				

Unless otherwise directed, working units for metric files should use "Millimeters" (column 4) and English files should use "Feet/Inches" (column 1).

#### 3.3 Electronic Drawing File Naming Convention.

- a. Base Files.

Base files shall be named as follows.

**PR**oject **D**iscipline - short description of the base file contents. **EXT**

X X      X      - X .....X . X X X

Base files shall be named using the project identifier, the discipline, a hyphen, and a short description of the base file contents. Project identifiers and discipline letters are the same as those used for drawing files as described below. Symbols such as ~, Λ, >, or + are not allowed. The three digit extension should be the same as those used for drawing files.

- b. Drawing Files.

Drawing files shall be named based on the following naming convention. It is based on the Windows Operating System's ability to use long file names. All positions shall be filled in. Unknown positions should initially be filled in using an X.

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**PRoject Discipline SHEt number Feature SEries Purpose VErsion. EXT**

X X     X     X X X     X     X X     X     XX     . X X X  
 1 2     3     4 5 6     7     8 9     10     11 12     13 14 15

**One, Two.** Positions one and two identify the project. Two letter project identifiers have been established for each project by PE-T (Map Files) and are listed in Table 3-2.

*Table CHAPTER 3 -2 Project Identifiers*

<u>Project Identifier</u>	<u>Project Name</u>	<u>Project Location</u>
AG	Applegate River Dam & Reservoir	Oregon *
AK	Alkali Canyon	Oregon (NPW)
AL	Alsea Bay and River	Oregon
AM	Amazon Creek	Oregon
BC	Big Cliff Dam and Reservoir	Oregon *
BD	Bonneville Dam and Reservoir	Oregon/Washington *
BF	Blackfoot River	Idaho (NPW)
BL	Blue River Dam and Reservoir	Oregon *
BN	Bruneau River	Idaho (NPW)
BO	Boise River	Idaho (NPW)
BR	Boise River Reservoir	Idaho (NPW)
BT	Burnt River	Oregon (NPW)
CA	Calapooya River and Muddy Creek	Oregon
CB	Coos Bay and Rivers	Oregon
CC	Cascadia Dam and Reservoir	Oregon *
CF	Clark Fork River Basin	Idaho/Montana (NPW)
CG	Cottage Grove Dam and Reservoir	Oregon *
CH	Chetco Cove	Oregon
CK	Clackamas River	Oregon
CL	Columbia River	Oregon/Washington *
CO	Columbia River Report	Oregon/Washington *
CQ	Coquille River	Oregon
CR	Creswell Dam and Reservoir	Oregon *
CS	Columbia Slough	Oregon
CT	Clatskanie River	Oregon
CU	Cougar Dam and Reservoir	Oregon *
CW	Clearwater and Potlatch River	Idaho (NPW)
CZ	Cowlitz River	Washington
DC	Dalles Celilo Canal	Oregon
DD	The Dalles Dam and Reservoir	Oregon/Washington *
DE	Detroit Dam and Reservoir	Oregon *
DH	Dry Hollow	Oregon
DO	Dorena Dam and Reservoir	Oregon *
DP	Depoe Bay and Cape Shoalwater	Oregon
DR	Deep River	Washington
DS	Deschutes and Crooked Rivers	Oregon
DX	Dexter Dam and Reservoir	Oregon *
EC	Elk Creek Dam and Reservoir	Oregon *
FD	Foreign Drawings	
FL	Fall Creek Dam and Reservoir	Oregon *
FR	Fern Ridge Dam and Reservoir	Oregon *

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FS	Foster Dam and Reservoir	Oregon *
GA	Gales Creek	Oregon
GC	Gate Creek Dam and Reservoir	Oregon *
GE	General Drawings	
GL	Galesville Reservoir	Oregon
GP	Green Peter Dam and Reservoir	Oregon *
GR	Grand Ronde, Minan and Willowa Rivers	Oregon (NPW)
HB	Harney Basin and Silvies River	Oregon
HC	Hell's Canyon Report Snake River	Oregon/Idaho (NPW)
HD	Holley Dam and Reservoir	Oregon
HF	Henry's Fork and Teton Rivers	Idaho/Wyoming (NPW)
HL	Hill's Creek Dam and Reservoir	Oregon *
HY	Highway Maps Pacific Northwest	
JC	Johnson Creek	Oregon (NPW)
JD	John Day Dam and Reservoir	Oregon
JH	Jackson Hole	Wyoming *
JR	John Day and Crooked Rivers	Oregon
KG	Kellogg Creek	Oregon
LC	Lost Creek	Oregon *
LE	Lewis River	Washington
LK	Lake River and Vancouver Lake	Washington
LP	Lookout Point (Meridian Dam) Dam-Reservoir	Oregon *
LR	Luckiamute River and Rickreall Creek	Oregon
LS	Lewisville Dam and Reservoir	Oregon
LT	Long Tom River	Oregon
LU	Lucky Peak Dam and Reservoir	Idaho (NPW)
LW	Lewis and Clark River	Oregon
MC	Mill Creek	Washington
MD	McNary Dam	Oregon/Washington (NPW)
MF	Willamette River Middle Fork and Salmon Creek	Oregon
MH	Malheur River	Oregon
MK	McKenzie River	Oregon
ML	Molalla River	Oregon
MM	Marys and Muddy Rivers	Oregon
MR	United States Moorings	Oregon
MS	Mountain Sheep Dam Report Snake River	Oregon/Idaho (NPW)
MU	Multnomah Channel	Oregon
NC	Necanicum River	Oregon
NE	Nehalem Bay and River	Oregon
NK	Neskowin Creek	
NP	North Pacific Division	Oregon
NS	Nelscott Beach	Oregon
NT	Nestucca River	Oregon
OC	Oregon City Locks	Oregon
OW	Owyhee River	Oregon/Idaho
PD	Portland District	Oregon
PL	Palouse River	Idaho (NPW)
PN	Portneuf River	Oregon
PO	Port Orford	Oregon
PW	Powder River	Oregon (NPW)
PY	Payette River	Oregon
QC	Quartz Creek Dam and Reservoir	Oregon
RD	Red Rock Creek	
RI	Rickreall Creek	

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RO	Rogue and Applegate Rivers	Oregon *
RW	Row River and Mosby Creek	Oregon
SA	Salmon and Lemhi Rivers	Idaho
SC	Smugglers Cove	Oregon
SE	Siletz Bay and River	Oregon
SH	Sweet Home Dam and Reservoir	Oregon
SI	Shitike Creek	
SL	Siuslaw River	Oregon
SM	Salmon River	Oregon
SN	Snake River	Washington or Idaho
SO	Scappoose Creek	Oregon
SP	Spirit Lake, Mt. St. Helens	Washington
SQ	Squaw Creek	
SR	Snake River Navigation Project	Washington or Idaho
SS	Sandy and Salmon Rivers	Oregon
ST	Santiam River	Oregon
SU	Strube Dam and Reservoir	Oregon
S1	Ice Harbor	Washington (NPW)
S2	Monumental Dam and Reservoir	Washington (NPW)
S3	Little Goose Dam and Reservoir	Washington (NPW)
S4	Granite Point Dam and Reservoir	Washington (NPW)
TD	Troutdale Lab	Oregon
TF	Treaty Fishing Sites	Oregon/Idaho (NPW)
TL	Tualitan River	Oregon
TM	Tillamook Bay and Vicinity	Oregon
TT	Tum Tum Dam and Vicinity	Oregon
TR	Toutle River	Washington
TU	Tualatin River (Changed to TL 10/19/49)	Oregon
UB	Umitilla River and Birch Creek	Oregon (NPW)
UD	Umitilla Dam and Reservoir	Oregon/Washington (NPW)*
UM	Umpqua River	Oregon
UR	Umatilla River	Oregon (NPW)
UW	Upper Willamette River	Oregon *
WA	Walla Walla River	Washington (NPW)
WB	Willamette River Basin (General)	Oregon *
WC	Willow Creek Reha Creek	Oregon (NPW)
WD	Wiley Creek Dam and Reservoir	Oregon *
WE	Weiser River	Idaho (NPW)
WH	White Bridge Dam and Reservoir	Oregon *
WL	Willamette Falls Locks	Oregon *
WR	Willamette River	Oregon *
WS	Wilson River	Oregon
WT	Waldo Lake Tunnel	Oregon
WW	Walla Walla and Touchet Rivers	Washington (NPW)
YB	Yaquina Bay and River	Oregon
YM	Yamhill River and South Fork	Oregon
WV	Warner Valley	Oregon
WM	Warm Springs	Oregon

(NPW) Indicates drawings are on file at Walla Walla District

(\*) Indicates further breakdown on separate sheets

**Three.** Position three identifies the design discipline/section that is preparing the drawing. Discipline/section codes are listed below. Additional codes may be developed as required.

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W - General  
S - Structural  
A - Architectural  
M - Mechanical  
H - Hydrology and Hydraulics  
G - Geotechnical  
E - Electrical  
C - Civil  
L - Landscaping  
I - Informational

**Four, Five, and Six.** Positions four, five and six identify the drawing number and should correspond to the sheet (or plate) number. Place a zero (0) in position four if the sheet number is less than 100 and a zero (0) in position five if the sheet number is less than 10.

**Seven.** Position seven identifies the major feature of the project. The basic feature codes are listed below. Additional feature codes may be assigned by PE-T.

D - Concrete Dam, Spillway, Intake/Outlet Works  
E - Earth and Rockfill Dams  
F - Fish Related  
G - General  
L - Levees  
N - Navigation Locks  
P - Powerhouse  
R - Relocations  
X - Informational  
W - Recreational  
O - Other

**Eight and Nine.** Positions eight and nine identify the project series number and is assigned by PE-T. If the series number is less than 10, place a zero (0) in position eight.

**Ten.** Position ten identifies the purpose of the drawing. Additional designations may be added by PE-T as required.

G - General Design Memorandum  
F - Feature Design Memorandum  
C - Plans and Specifications Drawing  
A - As-Built Drawing  
L - Letter Report  
S - Studies  
M - Field Sketches

**Eleven and Twelve.** Positions eleven and twelve identify the version of the file. The numbers are sequential beginning with 01 and increase by one each time a new drawing is issued for an amendment or modification. Be sure to zero fill.

**Thirteen, Fourteen, and Fifteen.** Positions thirteen, fourteen and fifteen are the file extension and identify the file format. These designators generally depend on the software used to create the file. A short list of possible extensions follow.

DGN - MicroStation Design File format  
TIN - Binary Triangle file  
XYZ - Binary Point file  
DWG - Auto CADD File  
XLS - Excel file  
DOC - MS-Word file

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DXF - Generic drawing exchange file format  
000 - output plot file

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### **3.4 Designer's Notes.**

For each significant design feature, the designer's notes should as a minimum indicate the design codes used, design loads, materials specified, and the designated material strengths for that feature. Designer's notes shall be placed on the drawing as the drawing is being prepared. This will ensure that sufficient space exists for the designer's notes. This information serves to clarify the information contained in the contract specifications and aids individuals preparing future repairs or rehabilitation work.

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### CHAPTER 4 - LEVEL/LAYER ASSIGNMENTS

#### 4.1 General.

CADD levels and layers are analogous to overlays in manual drafting systems and serve to separate graphic elements (lines, shapes, and text) according to the design feature they represent.

#### 4.2 CADD Level Structure.

Due to the wide variety of structures found at civil works projects (i.e. dams, locks, spillways, fish facilities, etc.), a standard CADD levels table that could be applied to all structures was determined not feasible. However, for most drawings, the following level assignments listed in Tables 4-1 and 4-2 are applicable.

*Table CHAPTER 4 -1 Base File CADD Level Assignments*

LEVEL	LEVEL ASSIGNMENTS	LC=	CO=	WT=
1	Levels Chart	0	1	1
2	Levels Chart Information	0	2	1
3	Project Baseline	0	3	1
4	Temporary Elements and Notes to Drafter	0	4	1
5	<reserved for future assignments>			
6-63	Open			

*Table CHAPTER 4 -2 Drawing File CADD Level Assignments*

LEVEL	LEVEL ASSIGNMENTS	LC=	CO=	WT=
1	Title Block Info. (Drawing Title, Designer, Sheet No., Etc.)	0	1	VAR.
2	Revision Block Text and Symbols	0	2	VAR.
3	Centerlines, Matchlines, and Keypoints	VAR.	3	VAR.
4	Drafter's Guide Lines (Temporary)	0	4	VAR.
5	Dimensioning Lines, Arrows, And Dimension Text	0	5	1
6	Grids And Baselines For Charts And Tables	0	6	VAR.
7	Drawing Text and Designer's Notes	0	7	1
8	Section & Detail Markers, Titles, Scales, Breaklines, and North Arrow	VAR.	0	VAR.
9	Patterning	VAR.	1	VAR.
10	Patterning	VAR.	10	VAR.
11	<reserved for future assignments>			
12	<reserved for future assignments>			
13	<reserved for future assignments>			
14	<reserved for future assignments>			
15	<reserved for future assignments>			
16-63	Open			

The lead engineer/technician for each discipline is responsible for determining which drawing elements are assigned to which levels. General guidelines for assigning elements to levels are as follows:

- (1) Levels shall be consistently applied to all drawings within each discipline.
- (2) Hidden lines shall be on a different level than the main object lines.
- (3) No text shall be on the same level as any line work.
- (4) The levels chart shall be filled out for each base and drawing file.

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## CHAPTER 5 - REFERENCE FILES

### 5.1 General.

Reference files enable designers to share drawing information electronically, eliminating the need to exchange hard copy drawings among the design disciplines. This real-time access to the work of others ensures accuracy and consistency within a set of drawings and helps promote concurrent design efforts. No longer does one discipline have to wait until another is nearly complete before they begin their drawings.

### 5.2 Application.

Reference files should be used whenever information will need to be shared. Base files will normally contain the main drawing elements of the model (i.e. structure outline, reinforcement, electrical conduit, plumbing, etc.). Drawing files shall then be developed by referencing base files. Details, dimensions, and text may then be added to the drawing file. In addition, avoid referencing drawing files because drawing file names are subject to change at any time during the design phase.

### 5.3 Base Files.

The basic structure should be laid out using multiple levels which will allow other design disciplines to use the file by turning levels on or off.

- (1) Avoid patterning or text in base files with the exception of notes to the drafter on level 4.
- (2) Base files shall be drawn accurately and to actual size.
- (3) Plans shall be laid out with different elevations stacked on different levels at the same station and offset. Elevation and section base files shall be set up at the correct elevation.

### 5.4 Drawing Files.

Base files shall be referenced wherever possible.

- (1) The standard border file shall be used as a reference file.
- (2) Be consistent in drawing format for all drawings.
- (3) On completed drawings, no elements or text shall be located outside the border, except for text in the levels chart and active scale box.
- (4) The primary feature in the drawing file should be referenced at a scale of 1:1.
- (5) Border files shall be scaled as needed as well as any secondary plans, sections, or details.

### 5.5 Border Sizing.

The attached border file shall be scaled to include all elements of the drawing file. The tables provided are for standard contract size drawings (SI designation A2 (420 mm by 594 mm) for metric unit drawings and 14" by 20" for English unit drawings). The procedure to attach a border file to a drawing file is as follows:

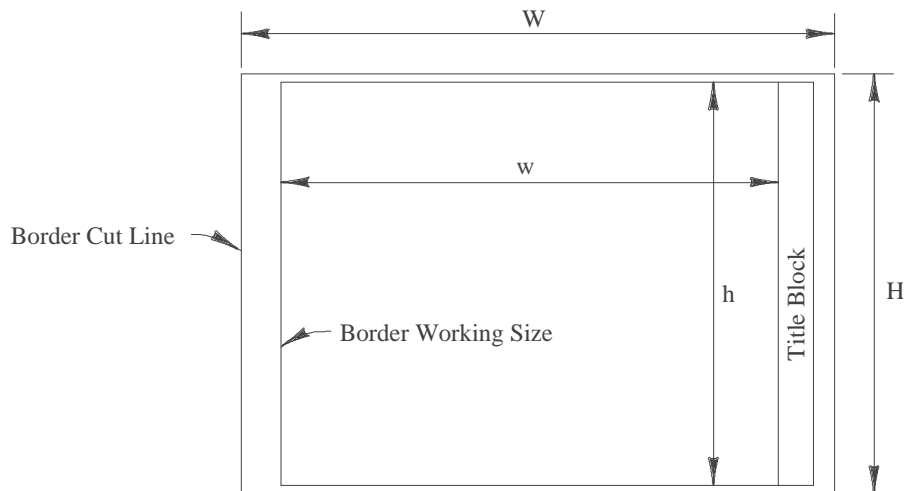
- (1) Measure the height and width of the major element(s) of the drawing file.
- (2) Locate the closest size to the measured height and width of the drawing file under the column "BORDER WORKING SIZE" in Table 5-1 (English units) or Table 5-2 (metric units).
- (3) Read the active scale from the "AS=" column.
- (4) Reference the border file and then scale it to the active scale (AS) determined in step 3.

Figure 5-1 is provided as a guide to using the figures.

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Table CHAPTER 5 -1 Border File Scaling for **English** Unit Drawings.

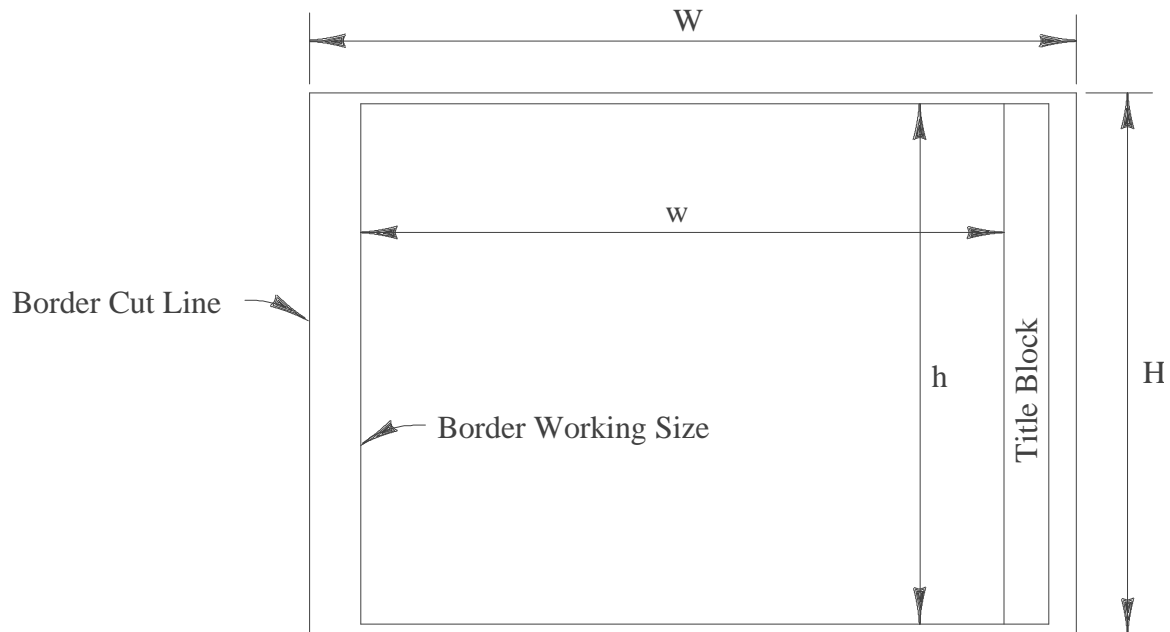
Scale	AS =	BORDER WORKING SIZE		BORDER CUT LINE	
		w (ft:in)	h (ft:in)	W (ft:in)	H (ft:in)
12" = 1'-0"	1	1:6	1:1.5	1:8	1:2
6" = 1'-0"	2	3:2	2:3	3:4	2:4
3" = 1'-0"	4	6:4	4:6	6:8	4:8
1 1/2" = 1'-0"	8	12:8	9:0	13:4	9:4
1" = 1'-0"	12	19:0	13:6	20:0	14:0
3/4" = 1'-0"	16	25:4	18:0	26:8	18:8
1/2" = 1'-0"	24	38:0	27:0	40:0	28:0
3/8" = 1'-0"	32	50:8	36:0	53:4	37:4
1/4" = 1'-0"	48	76:0	54:0	80:0	56:0
3/16" = 1'-0"	64	101:4	72:0	106:8	74:8
1/8" = 1'-0"	96	152:0	108:0	160:0	112:0
3/32" = 1'-0"	128	202:8	144:0	213:4	149:4
1/16" = 1'-0"	192	304:0	216:0	320:0	224:0
1" = 5'	60	95:0	67:6	100:0	70:0
1" = 10'	120	190:0	135:0	200:0	140:0
1" = 20'	240	380:0	270:0	400:0	280:0
1" = 30'	360	570:0	405:0	600:0	420:0
1" = 40'	480	760:0	540:0	800:0	560:0
1" = 50'	600	950:0	675:0	1000:0	700:0
1" = 60'	720	1140:0	810:0	1200:0	840:0
1" = 80'	960	1520:0	1080:0	1600:0	1120:0
1" = 100'	1200	1900:0	1350:0	2000:0	1400:0
1" = 200'	2400	3800:0	2700:0	4000:0	2800:0
1" = 300'	3600	5700:0	4050:0	6000:0	4200:0
1" = 400'	4800	7600:0	5400:0	8000:0	5600:0
1" = 500'	6000	9500:0	6750:0	10000:0	7000:0
1" = 1000'	12000	19000:0	13500:0	20000:0	14000:0



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*Figure CHAPTER 5 -1 Border File Scaling Aid*

<i>Table CHAPTER 5 -2 Border File Scaling for <b>Metric</b> Unit Drawings.</i>					
Scale	AS =	BORDER WORKING SIZE		BORDER CUT LINE	
		w (mm)	h (mm)	W (mm)	H (mm)
1:1	1	533	403	594	420
1:2	2	1066	806	1188	840
1:2.5	2.5	1332.5	1007.5	1485	1050
1:5	5	2665	2015	2970	2100
1:10	10	5330	4030	5940	4200
1:20	20	10660	8060	11880	8400
1:25	25	13325	10075	14850	10500
1:50	50	26650	20150	29700	21000
1:100	100	53300	40300	59400	42000
1:200	200	106600	80600	118800	84000
1:250	250	133250	100750	148500	105000
1:500	500	266500	201500	297000	210000
1:1000	1000	533000	403000	594000	420000



*Figure 5-1 Border File Scaling Aid.*

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### CHAPTER 6 - TEXT

#### 6.1 General.

All text on a drawing shall be in upper case lettering. Slanted text shall not be used.

#### 6.2 Text Styles/Fonts.

The text font used in all CADD drawings shall be MicroStation Font #3.

#### 6.3 Text Sizes.

Text shall have a minimum height of 1.5 mm (1/16") on a standard size contract drawing. The text height and width on final contract size drawings shall conform to the sizes listed in Table 6-1.

<i>Table CHAPTER 6 -1 Plotted Text Size</i>		
Type of Text	Text Size at AS=1 (English Units)	Text Size at AS=1 (Metric Units)
General Notes	0.0625"	1.5 mm
Dimensions	0.0625"	1.5 mm
Text in Bubble Callouts	0.0833"	2.0 mm
Section and Detail Titles	0.100"	2.5 mm

(1) Line spacing shall be 1/2 of the text height.

(2) Underlining shall be 30% of a line space below the text. The line weight shall be the same as the text.

#### 6.4 Text Sizing.

The recommended procedure for sizing text is listed below.

(1) Draw features in the drawing file and reference the border file as described in Chapter 5. Note the active scale (AS) of the border file.

(2) From Table 6-1, determine the plotted text size (English or metric) based on the type of text to be placed.

(3) From the text sizing tables (Tables 6-2 or 6-3), determine the scaled text size (TX=) based on the required plotted text size (as determined from Table 6-1) and the active scale of the referenced border file.

(4) Set the Text Size (TX=) and other text attributes and place text on the drawing.

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Table CHAPTER 6-2 Text Sizing Table ( <i>English Units</i> )				
Scale	AS =	Text Size (TX) in ft:in		
		0.0625"	0.0833"	0.100"
12" = 1'-0"	1	0:0.0625	0:0.0833	0:0.1
6" = 1'-0"	2	0:0.125	0:0.167	0:0.2
3" = 1'-0"	4	0:0.25	0:0.333	0:0.4
1 1/2" = 1'-0"	8	0:0.5	0:0.667	0:0.8
1" = 1'-0"	12	0:0.75	0:1	0:1.2
3/4" = 1'-0"	16	0:1	0:1.333	0:1.6
1/2" = 1'-0"	24	0:1.5	0:2	0:2.4
3/8" = 1'-0"	32	0:2	0:2.667	0:3.2
1/4" = 1'-0"	48	0:3	0:4	0:4.8
3/16" = 1'-0"	64	0:4	0:5.333	0:6.4
1/8" = 1'-0"	96	0:6	0:8	0:9.6
3/32" = 1'-0"	128	0:8	0:10.667	1:0.8
1/16" = 1'-0"	192	1:0	1:4	1:7.2
1" = 5'	60	0:3.75	0:5	0:6
1" = 10'	120	0:7.5	0:10	1:0
1" = 20'	240	1:3	1:8	2:0
1" = 30'	360	1:10.5	2:6	3:0
1" = 40'	480	2:6	3:4	4:0
1" = 50'	600	3:1.5	4:2	5:0
1" = 60'	720	3:9	5:0	6:0
1" = 80'	960	5:0	6:8	8:0
1" = 100'	1200	6:3	8:4	10:0
1" = 200'	2400	12:6	16:8	20:0
1" = 300'	3600	18:9	25:0	30:0
1" = 400'	4800	25:0	33:4	40:0
1" = 500'	6000	31:3	41:8	50:0
1" = 1000'	12000	62:6	83:4	100:0
WT =		1	1	2

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<i>Table CHAPTER 6 -3 Text Sizing Table (Metric Units)</i>				
Scale	AS =	Text Size (TX) in mm		
		1.5	2	2.5
1:1	1	1.5	2	2.5
1:2	2	3	4	5
1:2.5	2.5	3.75	5	6.25
1:5	5	7.5	10	12.5
1:10	10	15	20	25
1:20	20	30	40	50
1:25	25	37.5	50	62.5
1:50	50	75	100	125
1:100	100	150	200	250
1:200	200	300	400	500
1:250	250	375	500	625
1:500	500	750	1000	1250
1:1000	1000	1500	2000	2500
<b>WT =</b>		<b>1</b>	<b>1</b>	<b>2</b>

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### **CHAPTER 7 - CELL LIBRARIES**

#### **7.1 General.**

A “cell” in MicroStation is a group of graphical elements that can be manipulated as a single entity. Examples of typical cells are windows, bar scales, furniture, area patterns, and legends. The use of cells enhances CADD productivity and provides an excellent opportunity for standardizing symbols.

#### **7.2 Design Branch Cell Libraries.**

Design Branch maintains two general cell libraries used by all Portland District CADD users (file names: pdx\_english.cel for English drawings and pdx\_metric.cel for metric drawings). The general cell libraries contain section and detail reference “bubbles”, bar scales, and other symbols that represent standard drafting practices by the Portland District. These cells should be used to the extent possible to ensure consistency among all project drawings. Graphical presentations of each of these cell libraries can be found in Appendix A.

#### **7.3 Creating Cells.**

The creation of new cells for the general cell libraries should be coordinated with the CADD management group. Cells should be created whenever the repetitive use of a group of elements is required. Cells should not be created or used if MicroStation standard symbols or cells are available. Each new cell should include the cell name and a brief description of the cell.

#### **7.4 Other Cell Libraries.**

Other cell libraries are maintained by each design discipline. Information regarding these cell libraries can be obtained from the respective sections. Many of the design discipline cell libraries are located on the CADD server “Tyler”, under “Tyler\Standard\PE”.

#### **7.5 Placing Cells.**

Cells shall be scaled to the active scale of the drawing file. In addition, cells shall be placed on the correct level.

#### **7.6 Shared Cells.**

Shared cells should be used when practical in order to reduce the size of the drawing file.

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### **CHAPTER 8 - DELIVERABLES AND DATA EXCHANGE**

#### **8.1 General.**

This section describes procedures and standards for exchanging drawings and drawing files between Portland District, A/E firms, and other agencies.

#### **8.2 Electronic Drawing Files.**

a. Transferring Electronic Files. The preferred medium for exchanging electronic drawing files is the Internet. File transfer protocol (ftp) on the Internet allows the transfer of electronic files independent of the hardware platforms used by either party. The Portland District CADD manager should be contacted regarding procedures and methods for exchanging electronic files using ftp.

b. File Compatibility. If the files are found to be incompatible with the Portland District's CADD software, the A/E firm or agency will be required to resubmit compatible electronic copies and drawing prints.

c. Virus Checking. A/E firms or agencies shall scan their drawing files for computer viruses prior to transmitting them.

d. Electronic File Format. The final contract drawing files shall be formatted as follows:

(1) Remove all extraneous graphics outside the border area, and set the active parameters to a standard setting or those in the seed/prototype file.

(2) Turn level symbology on in all views. Set overrides off.

(3) Text nodes shall be turned off.

(4) Bore site lock should be turned on in 3-dimensional files.

(5) Make sure all reference files are attached without device or directory specifications.

(6) Make sure that all support files are in the same directory and that references to those files do not include device or directory specifications.

(7) Include any standard sheets (i.e., abbreviation sheets, standard symbol sheets, etc.) necessary for a complete project.

(8) View one shall be set up to plot the drawing.

(9) Compress each drawing file using the MicroStation "Compress Design" command.

#### **8.3 Hard Copy.**

A/E firms shall provide one contract size reproducible hard copy of each finished drawing with the final submittal.

#### **8.4 Drawing Lock-Up Procedure.**

When drawings are out for bid, the lead engineer or technician shall coordinate with the CADD manager to lock-up (Read Only) all drawings and referenced drawings. After an amended or modified drawing has been sent to Contracting or the Technical Services Branch, it shall be immediately locked-up.

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### CHAPTER 9 - AS-CONSTRUCTED DRAWING PROCEDURES

#### 9.1 General.

The final contract drawings of any constructed project shall reflect the as-constructed condition of that project. This chapter describes the procedures necessary to ensure that the as-constructed drawings accurately reflect the final site conditions.

#### 9.2 Procedures.

Steps to completing as-constructed drawings for a project are outlined below.

(1) The as-constructed conditions for a particular project shall be reviewed by the Technical Manager. It is assumed that these conditions have been forwarded to Planning and Engineering Division from Operations/Construction Division.

(2) The Technical Manager for the project shall be responsible for managing the completion of all as-constructed drawings. For projects with multiple disciplines, each of the other disciplines with drawings to mark up as as-constructed shall coordinate their work with the Technical Manager.

(3) Changes are made as needed to the contract drawings to reflect the changes that may have occurred during the construction of the project. These drawings will show the condition of the project as it is turned over to the Government.

(4) Revision notes and triangles shall remain on the electronic copies of the drawings. Hard copy prints of the drawings shall not include the notes or triangles on the drawing unless requested by the user. No new triangles are to be placed on the body of the drawing.

(5) The first sheet in the drawing set will get the As-Constructed box with the complete set of data as shown in Figure 9-1.

<b>AS-CONSTRUCTED</b> CONTRACT NO. DACW57- _____ CONTRACTOR _____ DATE OF RECEIPT OR NOTICE TO PROCEED _____ DATE OF COMPLETION OF CONTRACT _____ DATE OF ACCEPTANCE _____
---

*Figure CHAPTER 9 -1 As-Constructed Cell ASCOCO.*

(6) The status block in the border file shall be updated with the contract number and the as-constructed date as shown in Figure 9-2.

<b>AS-CONSTRUCTED</b> CONTRACT NO. DACW57-97-C-0016 AS-BUILT AS OF 10 DEC 97
--

*Figure CHAPTER 9 -2 Sample Status Block with As-Constructed Information.*

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(7). All As-Constructed drawings shall be placed in a sub-directory marked \as\_built\ which shall be placed with the appropriate project. The completed As-Constructed drawings with the original CADD file names shall become the official drawings. Reference files shall also be placed in this sub-directory.

(8) When all drawings are completed as As-Constructed, the CADD manager shall lock-up (Read Only) the as-built directory.

## **APPENDIX D**

### **CHAPTER 10 - ARCHIVING OF CADD PRODUCTS**

#### **10.1 General.**

After the as-built CADD files for a project have been completed and locked up, the CADD manager shall be notified and the CADD files archived. The purpose of archiving CADD files is to permanently store CADD files in their electronic format. Access to the files will still be possible but only in a “read only” format. Back-up copies of the files will be made on permanent medium and stored at the project office and at a permanent offsite storage location.

#### **10.2 Procedures.**

The procedure for archiving CADD files shall be as follows:

- (1) The as-built drawings shall be formatted in accordance with paragraph 8.2 (d).
- (2) The Technical Manager shall notify the CADD manager that the CADD project files are ready to be archived.
- (3) A short text file shall be created in the project directory that describes the contents in the directory and any other pertinent information. The text file name shall be readme.txt.
- (4) The CADD manager shall make two copies of the files in the project directory on permanent media (CD-ROM). The permanent media shall be marked with the following information:
  - (a) Format and version (e.g., MS-DOS, version 6.0) of the operating system on which the media was created.
  - (b) Utilities (programs) required to read files on the CD-ROM.
  - (c) A short description of the contents.
- (5) One copy of the permanent media shall be given to the project office and one copy shall be sent to the permanent offsite storage location.
- (6) The project directory shall then be moved to the CADD server dedicated to archiving project files.